U. S. FOREST SERVICE

RESEARCH NOTE NC-51

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

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Size of Aspen Crop Trees Little Affected by Initial Sucker Density

ABSTRACT. — Size of aspen crop trees at age 15 years is essentially the same for a wide range of initial sucker densities. High densities are not necessary to produce adequately stocked stands.

Complete clearcutting of quaking aspen (*Populus tremuloides* Michx.) usually results in dense stands of suckers, but partial cutting, which includes many commercial clearcuts, results in much lower densities. Since initial densities vary from a few hundred to several thousand stems per acre, questions arise as to what constitutes adequate stocking and how sucker density affects growth and stand development.

In 1952 an experiment was installed in a 1-year-old stand of aspen suckers that had developed after a commercial clearcut of a well-stocked stand of mature aspen (site index 70-75 feet at 50 years).[1] After the logging and before the installation of any treatments, all residual aspen and other hardwoods were cut. Five levels of stocking were replicated three times on 1/20-acre plots with the following number of stems per acre: 260, 500, 1,000, 1,500, and 10,060 (check). Additional suckers that developed on the thinned plots were removed annually.

[1] *The first 5-year results of this study were published as Lake States Forest Exp. Sta. Tech. Note 490.*

Results show that natural mortality in dense aspen stands reduces the number of stems rapidly during the early years of growth. The stands with 10,000 one-year-old stems per acre had less than 2,000 stems after 15 years (fig. 1). This amounts to approximately 85-percent mortality for this period compared with 50 percent for the lightest thinning and about 23 percent for the heavier thinnings.

As expected, thinning resulted in differences in overall average diameter. Except for the 500-stems-per-acre treatment, the average diameter of all trees was inversely related to stand density. But the average diameter of crop trees only, again excepting the 500-stems-per acre treatment, showed no significant difference by treatment (table 1 and fig. 2).

The reason for the comparatively small average diameter in the treatment thinned to 500 stems per acre is not known. Since total tree heights within this treatment are also shorter by 8 to 10 feet, possibly site quality is lower than in the other treatments (table 1). Another plausible explanation for the low rate of growth is the high incidence of dieback, *Pollaccia radiosa* (frequently called *Napicladium tremulae*) which was noted in all three replications of this treatment at the 15-year remeasurement.

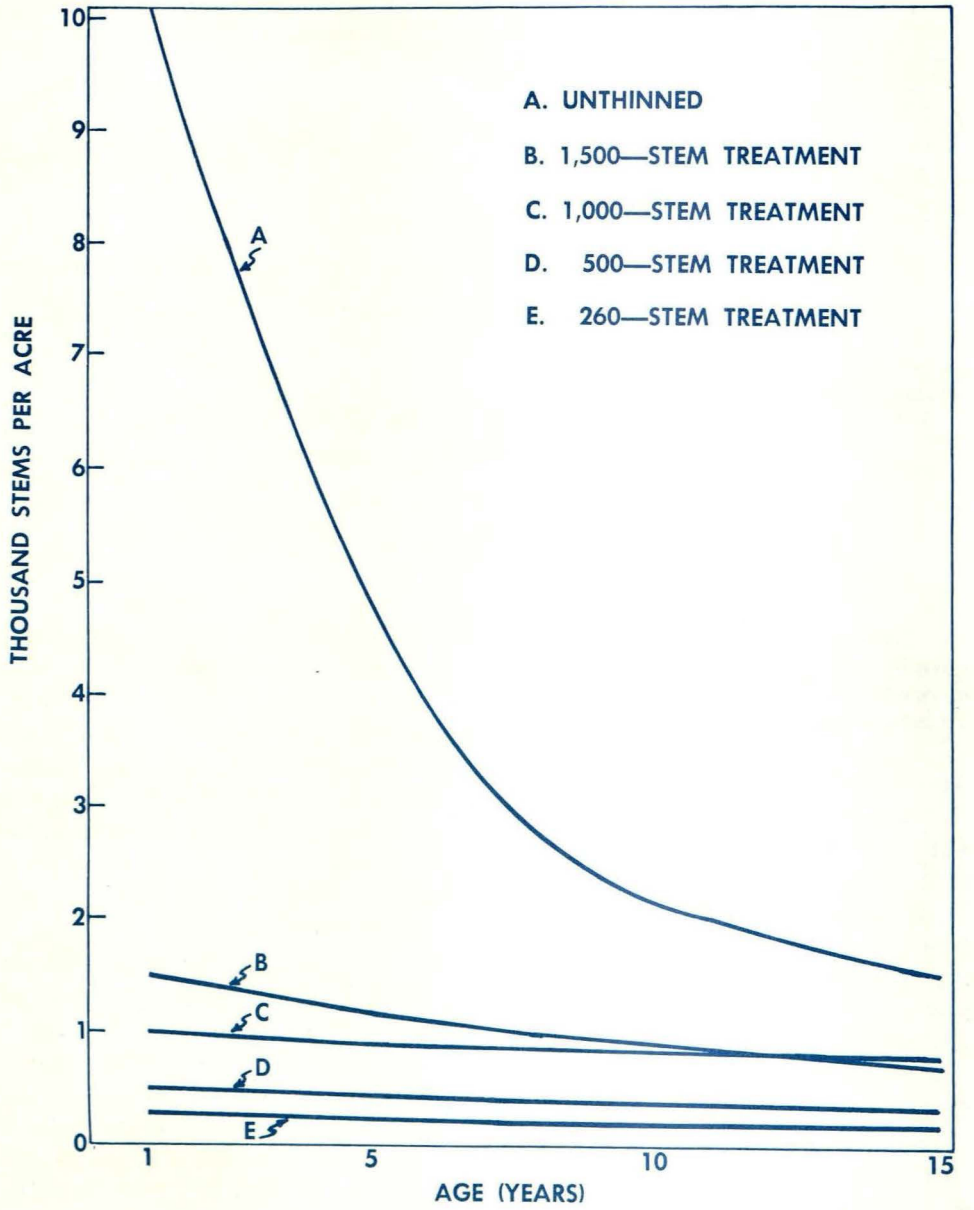

FIGURE 1. — Relation between age and number of stems per acre in thinned and unthinned young aspen stands.

Table 1. — Average diameter and total height of aspen suckers 15 years after thinning

Stems per acre after thinning	Average diameter (inches)			Average total height (feet)
	All trees	200 largest trees	400 largest trees	
10,060 (check)	2.5	4.2	3.9	32
1,500	3.1	4.5	4.0	31
1,000	3.5	4.6	4.3	30
500	2.9	3.8	1/ 2.9	22
260	4.3	2/ 4.3	2/ 4.3	31

1/ Based on 390 trees. 2/ Based on 190 trees.

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FIGURE 2. — The crop trees in this unthinned plot are nearly as large at age 15 years as those on the thinned plots.

A comparison of total cubic-foot volumes for the five treatments after 15 years of growth shows that the unthinned check area, with 830 cubic feet per acre has the greatest volume. In contrast, the two most heavily thinned treatments have only about one-fourth this volume (fig. 3). Differences between means of the unthinned plots and the two lighter thinnings are not significant.

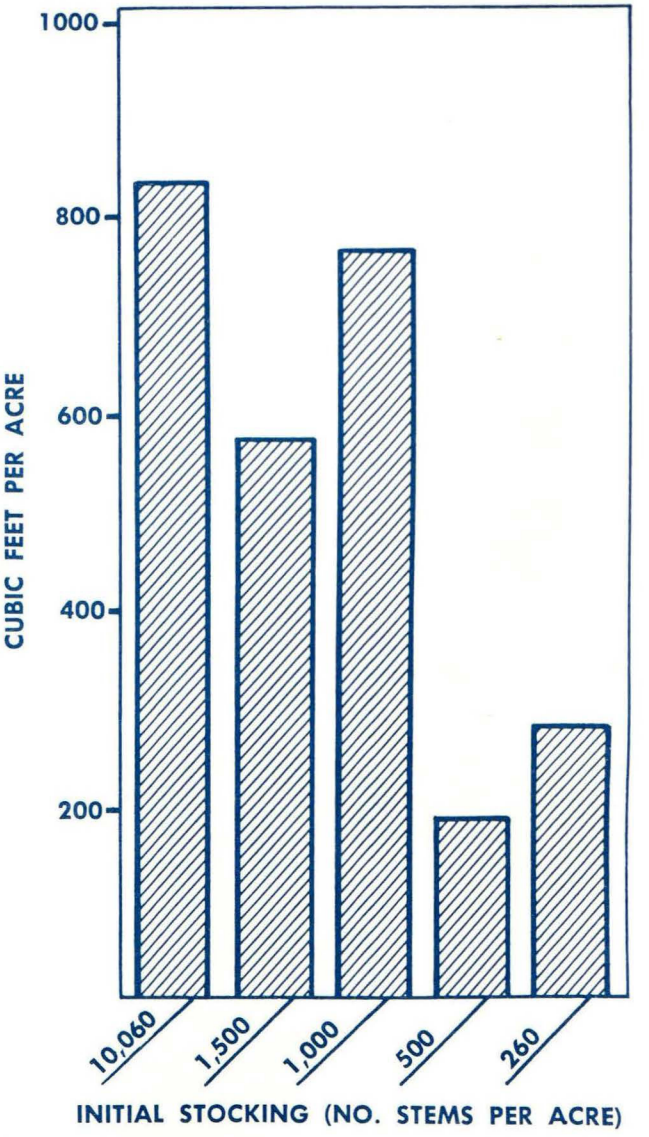

FIGURE 3. — Relation between initial stocking density and cubic feet per acre after 15 years of growth.

The results of this study show that if the forest manager obtains an aspen sucker stand ranging from 1,000 to 10,000 one-year-old stems per acre on a good site after complete removal of the overstory, he will have an adequate number of potential crop trees 15 years later without thinning; and lack of thinning will not affect their diameter.

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